

1. SUBSTANCE AND SOURCE IDENTIFICATION

SRM Number: 64c
SRM Name: High-Carbon Ferrochromium
Other Means of Identification: Not applicable.

This Standard Reference Material (SRM) is intended primarily for use in checking chemical methods of analysis and in calibration with instrumental methods of analysis. A unit of SRM 64c consists of fine powder (<150 μm ; -100 mesh).

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Classification

| | | |
|-------------------------|--------------------|------------|
| Physical Hazard: | Not classified. | |
| Health Hazard: | Skin Sensitization | Category 1 |
| | Carcinogenic | Category 2 |

Symbol

WARNING

| | |
|------|--|
| H317 | May cause an allergic skin reaction. |
| H351 | Suspected of causing cancer (lung) via inhalation. |

| | |
|-----------|---|
| P201 | Obtain special instructions before use. |
| P202 | Do not handle until all safety precautions have been read and understood. |
| P260 | Avoid breathing dust. |
| P272 | Contaminated work clothing must not be allowed out of the workplace. |
| P280 | Wear eye protection, protective gloves and clothing. |
| P302+P352 | If on skin: Wash with plenty of water. |
| P333+P313 | If skin irritation or rash occurs: Get medical attention. |
| P308+P313 | If exposed or concerned: Get medical attention. |
| P364 | Wash contaminated clothing before reuse. |
| P405 | Store locked up. |
| P501 | Dispose of contents and container according to local regulations. |

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: High-Carbon Ferrochromium

Other Designations: Chromium alloy, base, Cr, C, Fe, N, Si (Ferrochromium); CrFe

Components are listed in compliance with OSHA's 29 CFR 1910.1200. The material contains trace amounts of other metals; for the actual values see the NIST Certificate of Analysis.

| Hazardous Component(s) | CAS Number | EC Number (EINECS) | Nominal Mass Concentration (%) |
|------------------------|------------|--------------------|--------------------------------|
| Chromium | 7440-47-3 | 231-157-5 | 68 |
| Iron | 7439-89-6 | 231-096-4 | 25 |
| Carbon | 7440-44-0 | 231-153-3 | 4.7 |
| Silicon | 7440-21-3 | 231-130-8 | 1.22 |
| Nickel | 7440-02-0 | 231-111-4 | 0.43 |

4. FIRST AID MEASURES

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water.

Eye Contact: Flush eyes with water for at least 15 minutes. If necessary, seek medical attention.

Ingestion: If adverse effects occur after ingestion, seek medical treatment.

Most Important Symptoms/Effects, Acute and Delayed: May aggravate respiratory disorders. Prolonged exposure to nickel compounds may cause cancer.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek medical attention if needed.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard in bulk form. Dust/air mixtures may ignite or explode. Avoid generating dust. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:

Suitable: Dolomite, dry powder from metal fires, dry sand, graphite, soda ash, sodium chloride.

Unsuitable: None listed.

Specific Hazards Arising from the Chemical: None listed.

Special Protective Equipment and Precautions for Fire-Fighters: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 1

Fire = 3

Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Any accumulated material on surfaces should be removed and properly disposed of. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

Methods and Materials for Containment and Clean up: Collect spilled material in appropriate container for disposal. Keep out of water supplies and sewers. Keep unnecessary people away, isolate hazard area and deny entry.

7. HANDLING AND STORAGE

Safe Handling Precautions: Minimize dust generation and accumulation on surfaces. Routine housekeeping should be instituted to ensure that dust does not accumulate on surfaces. See Section 8, “Exposure Controls and Personal Protection”. Avoid contact with incompatible materials (see Section 10, “Stability and Reactivity”).

Storage: Store and handling in accordance with all current regulations and standards.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

| Exposure Limits | | | |
|-----------------|--|---|--|
| Components | OSHA (PEL) | ACGIH (TLV) | NIOSH (REL) |
| Chromium | TWA: 1 mg/m ³ | TWA: 0.5 mg/m ³ | TWA: 0.5 mg/m ³ IDLH: 250 mg/m ³ |
| Nickel | TWA: 1 mg/m ³ | TWA: 1.5 mg/m ³ (inhalable fraction) | TWA: 0.015 mg/m ³ IDLH: 10 mg/m ³ |
| Silicon | TWA: 5 mg/m ³ (respirable fraction) TWA: 15 mg/m ³ (total dust) | no occupation exposure limits established. | TWA: 5 mg/m ³ (respirable fraction) TWA: 10 mg/m ³ (total dust) |

No occupational exposure limits available for iron and carbon.

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

Descriptive Properties

Appearance (physical state, color, etc.)

Molecular Formula

Molar Mass (g/mol)

Odor

Odor threshold

pH

Evaporation rate

Melting point/freezing point

Density (specific gravity, water = 1)

Vapor Pressure

Vapor Density (air = 1)

Viscosity (cP)

Solubility(ies)

Partition coefficient (n-octanol/water)

Nominal Particle Size

Ferrochromium

fine powder

not available

not available

not available

not available

not available

not available

1458 °C (2656 °F)

6.9

not available

not available

not available

insoluble in water

not available

<150 µm

| | |
|---|----------------------|
| Thermal Stability Properties | Ferrochromium |
| Autoignition Temperature | not available |
| Thermal Decomposition | not available |
| Initial boiling point and boiling range | not available |
| Explosive Limits, LEL (Volume %) | not available |
| Explosive Limits, UEL (Volume %) | not available |
| Flash Point | not available |
| Flammability (solid, gas) | not available |

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: X Stable Unstable

Possible Hazardous Reactions: None listed.

Conditions to Avoid: Avoid generating dust. Avoid heat, flames, sparks, and other sources of ignitions. Avoid contact with incompatible materials.

Incompatible Materials: Combustible materials, acids, bases, metals, oxidizing materials, halogens, and peroxides.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Thermal decomposition will produce oxides of iron, chromium compounds.

Hazardous Polymerization: Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation X Skin Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: May aggravate respiratory disorders.

Potential Health Effects (Acute, Chronic, and Delayed)

Inhalation: Acute exposure may result in mechanical irritation. Kidney cancer, lung cancer, and prostate cancer have occurred in ferrochromium workers. Repeat exposure to carbon may cause pulmonary disorders and lung damage. Repeated exposure to various chromium compounds have resulted in ulceration, perforation of nasal septum, throat and respiratory tract irritation, and pulmonary sensitization. Repeat exposure to iron may cause mottling of the lungs (siderosis) with bronchitis.

Skin Contact: Acute exposure may cause mechanical irritation. Chronic exposure may cause dermatitis and "chrome holes", sensitization to chromium, and kidney damage.

Eye Contact: May cause irritation or conjunctivitis.

Ingestion: May cause irritation. Ingestion of sufficient amounts of chromium may result in dizziness, thirst, abdominal pain, vomiting, shock, and uremia, which may be fatal.

Numerical Measures of Toxicity

Acute Toxicity: Not classified.

Iron, Rat, Oral LD50: 984 mg/kg; 750 mg/kg.

Carbon, Rat, Oral LD50: >10000 mg/kg.

Nickel, Rat, Oral LD50: >9000 mg/kg.

Silicon, Rat, Oral LD50: 3160 mg/kg.

Skin Corrosion/Irritation: Not classified.

Serious Eye Damage/Eye Irritation: Not classified.

Respiratory Sensitization: Not classified.

Skin Sensitization: Category 1.

Repeat exposure to nickel may cause sensitization dermatitis.

Germ Cell Mutagenicity: Not classified.

Carcinogenicity: Category 2.

Listed as a Carcinogen/Potential Carcinogen X **Yes** **No**

Ferrochromium and components iron, carbon, and silicon are not listed by OSHA, IARC, or NTP as a carcinogen/potential carcinogen.

Chromium is listed by IARC as Group 3 (*not classifiable*), and not listed by OSHA and NTP.

Nickel alloys are listed as Group 2B (*possibly carcinogenic to humans*) by IARC; nickel alloys are not evaluated by NTP or listed by OSHA.

Tumorigenic

Iron, Rat, intratracheal, TDLo: 450 mg/kg (15 week).

Chromium, Rabbit, implant, TDLo: 75 mg/kg; 1200 µg/kg (6 week).

Nickel, Rat, intramuscular, TD: 125 mg/kg (13 week); subcutaneous TDLo: 3000 mg/kg (6 week).

Mutagenic

Chromium, Human, 5 µmol/L (1 h).

Nickel, Hamster, 400 mg/L.

Reproductive Toxicity: Not classified.

Carbon, Rat, subcutaneous TDLo: 167 mg/kg (pregnant 8 days).

Nickel, Rat, oral, TDLo: 158 mg/kg (multigeneration).

Specific Target Organ Toxicity, Single Exposure: No data available.

Specific Target Organ Toxicity, Repeated Exposure: No data available.

Aspiration hazard: Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: No data available for this high-carbon ferrochromium material.

Nickel: Fish, carp (*Cyprinus carpio*) LC50 (96 h): 1.3 mg/L [semi-static]; 10.4 mg/L [static].

Algae, (*Pseudokirchneriella subcapitata*) EC50 (72 h): 0.175 mg/L to 0.311 mg/L [static].

Invertebrate, water flea (*Daphnia magna*) EC50 (48 h): 1 mg/L [static].

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations. Subject to disposal regulations: US EPA 40 CFR 262 Hazardous waste: D001, D007. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the regulatory limit, 5 mg/L for chromium.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Not regulated by DOT or IATA.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4):

Chromium, 5000 lbs (2270 kg) final RQ (no reporting required if solid pieces >100 µm).

Nickel, 100 lb (45.5 kg) final RQ (no reporting required if solid pieces >100 µm).

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65):

Chromium, 1 % de minimis concentration.

Nickel, 0.1 % de minimis concentration.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

| | |
|-----------------|-----|
| ACUTE HEALTH: | No |
| CHRONIC HEALTH: | Yes |
| FIRE: | Yes |
| REACTIVE: | No |
| PRESSURE: | No |

State Regulations:

California Proposition 65: Warning! This product contains a chemical (nickel) known to the state of California to cause cancer.

U.S. TSCA Inventory: The components (chromium, iron, carbon, silicon, and nickel) are listed.

TSCA 12(b), Export Notification: Not listed.

Canadian Regulations: WHMIS Information is not provided for this material.

16. OTHER INFORMATION

Issue Date: 03 October 2014

Sources: ChemADVISOR, Inc., SDS, *Ferrochromium*, 19 June 2014.

Key of Acronyms:

| | | | |
|--------|---|-------|--|
| ACGIH | American Conference of Governmental Industrial Hygienists | NRC | Nuclear Regulatory Commission |
| ALI | Annual Limit on Intake | NTP | National Toxicology Program |
| CAS | Chemical Abstracts Service | OSHA | Occupational Safety and Health Administration |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act | PEL | Permissible Exposure Limit |
| CFR | Code of Federal Regulations | RCRA | Resource Conservation and Recovery Act |
| DOT | Department of Transportation | REL | Recommended Exposure Limit |
| EC50 | Effective Concentration, 50 % | RM | Reference Material |
| EINECS | European Inventory of Existing Commercial Chemical Substances | RQ | Reportable Quantity |
| EPCRA | Emergency Planning and Community Right-to-Know Act | RTECS | Registry of Toxic Effects of Chemical Substances |
| IARC | International Agency for Research on Cancer | SARA | Superfund Amendments and Reauthorization Act |
| IATA | International Air Transportation Agency | SCBA | Self-Contained Breathing Apparatus |
| IDLH | Immediately Dangerous to Life and Health | SRM | Standard Reference Material |
| LC50 | Lethal Concentration, 50 % | STEL | Short Term Exposure Limit |
| LD50 | Lethal Dose, 50 % | TLV | Threshold Limit Value |
| LEL | Lower Explosive Limit | TPQ | Threshold Planning Quantity |
| MSDS | Material Safety Data Sheet | TSCA | Toxic Substances Control Act |
| NFPA | National Fire Protection Association | TWA | Time Weighted Average |
| NIOSH | National Institute for Occupational Safety and Health | UEL | Upper Explosive Limit |
| NIST | National Institute of Standards and Technology | WHMIS | Workplace Hazardous Materials Information System |

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <http://www.nist.gov/srm>.